

MOBILE FINANCE AND BANKS IN KYRGYZSTAN: NEW MODELS OF INTERACTION

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ABSTRACT

The objective of this study was to develop the mathematical model that can be used to predict the useful life for Sonalika DI-90 farm tractors in Juba. Data that sought the costs for spare parts, repairs, oils, oils and fuel filters, grease, tire replacement, fuel, and tractor operator, in addition to the annual operating hours and the purchase or list price were collected using well-structured questionnaires. The Microsoft Excel 2010 was used to perform regression analysis on the accumulated total cost per hour which was considered as a dependent variable and thus, labelled on Y-axis and the age of operation that was regarded as an independent variable and thus, labelled on X-axis. The five models of exponential, linear, logarithmic, polynomial, and power were tried and it was determined that the polynomial model was the suitable model for predicting the useful life for the Sonalika DI-90 farm tractors operated in the two areas of Mapel and Rajaf East South of the Capital City of South Sudan Juba. The useful life for Sonalika DI-90 farm tractors was determined to be 18 years, with an accumulated operating hours of 4096.10 hours of operation.

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1. INTRODUCTION

The financial system of Kyrgyzstan has been undergoing significant changes in recent years, the main driver of which is digitalisation. Back in the early 2010s, the main way of interaction between a client and a bank was through visits to branches and ATM transactions. Electronic payment instruments were at an early stage of development, and the level of digital literacy was relatively low. However, by the mid-2020s, the situation has changed dramatically: the mobile phone has become not only a means of communication, but also a full-fledged financial instrument for many people.

In Kyrgyzstan, mobile finance is developing particularly actively - partly due to the high density of smartphone penetration, partly due to the natural demand of society

for more convenient, faster and inexpensive ways of financial interaction. Today, every second resident of the country uses mobile applications to pay for services, make transfers, top up balance and other daily transactions. According to the National Bank, the share of non-cash payments in the total volume of transactions continues to grow, and the number of mobile banking users increases annually by 15-20 per cent (Alalwan et al. 2018).

Against this background, banks are forced to change. From the classic model "bank - office - client" they are moving to a new scheme: "bank - application - user". Almost every major bank in the country has launched its own mobile application, including MBANK, Optima24, RSK24, Bakai24, FINCA Bank Kyrgyzstan, Kompanion and Halyk Bank. These apps offer not only basic

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functions - like checking balance or transferring funds - but also more sophisticated services: paying taxes, managing loans, opening deposits, making overseas transfers, signing up for insurance and more. Thus, mobile banking is becoming a full-fledged substitute for physical branches, especially in regions where access to banking infrastructure has been limited (Cavus & Chingoka, 2016; Chau & Chen, 2013).

In parallel with banking applications, electronic wallets are successfully developing in the market - for example, Elsom, DOSH CARD, Megapay, O!Money, and the Elcart payment system. These platforms are often more flexible and faster to innovate, are oriented towards everyday payments and microtransactions, and are therefore particularly popular with young people, small businesses and those who do not have regular access to banking services. For example, *Elsom*, integrated with KICB, allows you to pay for more than 200 types of services, including education, utilities, mobile phones and internet. And services such as O!Money are tied to mobile operators and allow you to manage both money and communications in one interface.

Thus, two parallel but overlapping streams are forming in the market: on the one hand - mobile applications of banks seeking to retain and expand their client base, and on the other - fintech services, which are increasingly perceived not as an alternative, but as a complement (Arner et al., 2018). The infrastructure only favours this: terminals across the country, QR code payment, integration with Google Pay and Apple Pay, Internet acquiring, ecosystems in the App Store and Google Play - all this makes mobile finance not just convenient, but truly mainstream (Antwi et al., 2023).

But a logical question arises: how are relations between banks and fintech structures built in these conditions? Is it competition or co-operation? Do e-wallets undermine the banking monopoly or, on the contrary, stimulate the banking system to develop? What models of interaction have already emerged, and what models are still emerging? And, finally, how does all this affect the end user - the average citizen of Kyrgyzstan who simply wants his money to be at his fingertips, safe and manageable in two clicks?

The purpose of this article is to analyse how Kyrgyzstan's digital financial ecosystem is developing, what trends are emerging in mobile finance, how banks are adapting to the new reality and what models of interaction between traditional and digital players are most promising in the rapidly changing financial landscape (Almosov et al., 2021).

2. LITERATURE REVIEW - TRANSFORMATION OF THE BANKING SECTOR UNDER THE INFLUENCE OF MOBILE FINANCE

Modern mobile technology is increasingly invading everyday life - and banking is no exception. As Abbas et al. (2018) and Abbasi and Weigand (2017) point out,

mobile finance has become a real revolution, breaking down the former boundaries between bank and customer. Today, you no longer need to queue at a branch to manage your funds: all you need is a smartphone and a stable connection. This change has not just simplified financial transactions - it has actually redefined the very notion of banking service.

Jaride and Taqi (2020), Sadiku et al. (2022) see mobile banking (or m-banking) as not just another digital tool, but a radical innovation that has overturned the logic of customer-banking interaction. Chen and Chen (2013) supports them, emphasising that, unlike traditional channels, mobile banking offers not only 24/7 access, but also unique mobility and independence, and most importantly, time savings, so important in today's pace of life.

Govender and Sihlali (2014) add that m-banking not only optimises banking processes but also significantly reduces operational costs for financial institutions themselves. This allows banks to abandon some of their physical branches, reducing costs, and allows customers to feel more autonomous. Asif et al. (2023) agree with this, emphasising that it is no longer a supplement to classic service channels, but a full-fledged replacement. Moreover, mobile banking allows not just to "transfer money" but to manage the whole spectrum of financial needs, including loans, investments and savings.

Roy and Shaw (2021) suggest that mobile finance should be viewed as a broad ecosystem that includes mobile remittances, payments, banking, insurance and other services. This approach provides insight into why mobile technology has become particularly important for countries with uneven financial infrastructure. As Al-Akhras et al. (2011) note, through mobile account access, a user can be included in the financial system even without a single ATM or bank branch nearby.

According to Gharaibeh et al. (2018), a key feature of mobile finance is how it transforms the very model of financial interaction. The user becomes an active participant in the financial environment rather than a passive customer. Moser (2015) makes an interesting observation that m-banking is no longer just a fashion trend, but a structural element of the retail banking of the future (Pejić Bach et al., 2020; Pelletier et al., 2019).

In developing countries, mobile money has become a tool for a real breakthrough in financial inclusion (Aziz et al., 2024). Gbongli et al. (2020) emphasise that it is mobile services that enable millions of people to access basic financial services for the first time. Dorfleitner and Nguyen (2022) describe this phenomenon as a shift from traditional banking to decentralised agent networks - such as M-Pesa in Kenya. This model has come to symbolise the success of digital financial inclusion in the global South (Lokossou & Tapsoba, 2019).

Fintech is also playing a serious role in this process. As Siska et al. (2023), Simatupang and Siska (2021) point out, today's fintech companies are not just competing with banks - they are shaping new standards of quality and speed of service (Turuev & Shashkina, 2023; Zheng et al., 2023). Technology giants such as Google and

Facebook are increasingly entering the mobile finance market, offering convenient payment solutions and developing ecosystems in which the bank is just one of the options.

Shaikh et al. (2022) emphasise that the development of fintech has reinforced the differences between three forms of financial services: traditional banking, mobile money and digital platforms. This differentiation, on the one hand, increases competition and, on the other hand, gives the user the opportunity to choose what is closer to him/her by habit, level of digital literacy or even just the interface.

Kyrgyzstan's financial system continues to be a key element of the country's economic infrastructure, despite internal challenges and limited resources. As Maratovna et al. (2022) note, the banking system plays a central role in the financial sector, but its potential has not yet been fully realised (Tashtamirov, 2023). This is especially true in regions where access to financial services is difficult due to weak infrastructure and limited bank presence.

Nurasheva et al. (2020) emphasise that geographical and institutional constraints remain a major barrier: the domestic market is small and people in remote areas are often not covered by basic financial services. However, the government is taking steps to liberalise the sector, encouraging foreign capital inflows into both commercial banks and microfinance institutions (Omurzakova et al., 2022; Xv & Meng, 2015). Satybaldieva (2021) provides concrete data: already in 2015, more than half of the banking sector was controlled by foreign capital, indicating the country's openness to investment in the financial sector.

An important area of reform has been the development of microfinance with the support of international partners. This segment has become a kind of compensator for the weak banking infrastructure, especially in rural and mountainous regions. However, as Kuhn and Bobojonov (2021) emphasise, the country's financial market remains fragmented. There is a clear division into formal and informal sectors: on one side are licensed banks, MFIs and credit unions, and on the other shadow moneylenders, vendors and family credit networks, often operating outside the legal framework (Kuhn & Bobojonov, 2021).

Nevertheless, in this seemingly complex structure, it is mobile finance that has begun to play a bridging role between traditional banking and the public. This is emphasised by Yong et al. (2023), who point out that even with a low penetration of classical banking services - around 40 per cent - mobile technology opens up entirely new opportunities. With a GNP per capita of \$1,280 and high mobile penetration (over 85%), Kyrgyzstan has all the prerequisites for a digital leap forward in the financial sector.

The e-payment market, as emphasised in the Yong et al. (2023) study, is growing rapidly. By 2020, 10 banks had already obtained licences to issue e-money, and the number of digital payment operators exceeded two dozen. The growth in the number of e-wallet users is particularly telling: from 1.2 million in 2018 to 1.9

million in 2019. This jump reflects the growing demand for convenient, cheap and accessible ways to manage personal finances.

Interestingly, electronic payments have become not just an alternative to cash payments, but often the only financial tool for people in hard-to-reach areas. As Satybaldieva (2021) emphasises, in such circumstances mobile finance is not just about technology, it is about financial inclusion and accessibility. People who were previously completely excluded from the banking system can now pay for services, transfer funds, save and even take out microloans, all through a smartphone screen.

Thus, the literature analysis shows that mobile finance in Kyrgyzstan is developing at the intersection of two opposing trends: on the one hand - institutional weakness of the banking sector, on the other - high mobile activity of the population and openness to digital solutions. This creates unique conditions in which mobile technologies can not only complement but also transform the financial system of the country, making it more flexible, accessible and oriented to the real needs of the population.

3. METHODOLOGY

This paper used a combined approach combining both qualitative and quantitative analyses. The theoretical framework was developed based on a review of the current literature on mobile finance, digitalisation of the banking sector and the transformation of financial services in developing country contexts. Special attention was paid to the works related to the countries of Central Asia and Kyrgyzstan, published in peer-reviewed journals, analytical reports of international organisations (World Bank, IMF, ADF, ADB) and materials of the National Bank of the Kyrgyz Republic.

In the empirical part of the study, the data of official statistics of the National Bank of the Kyrgyz Republic, the Ministry of Digital Development and international databases such as World Bank Data and IMF Financial Access Survey were used.

To quantitatively confirm the hypothesis that the development of mobile finance contributes to the growth of the share of non-cash payments, the article uses a simple regression model. We proceeded from the assumption that the more citizens actively use mobile banking and e-wallets, the higher the volume of non-cash transactions in the total payment turnover of the country becomes.

In the model (1), the dependent variable is the share of non-cash payments Y_t , expressed as a percentage of the total volume of transactions. The factors (independent variables) are:

- $X_{(1t)}$: number of mobile banking users (in year t);
- $X_{(2t)}$: number of users of electronic wallets (in year t).

Thus, the model takes the following form:

$$Y_t = \alpha + \beta_1 \cdot X_{(1t)} + \beta_2 \cdot X_{2t} + \varepsilon_{(t)} \quad (1)$$

where

- α is the free term (constant),
- β_1, β_2 - sensitivity coefficients,
- ε_t - random error.
- t is the year of observation.

The model was estimated using the ordinary least squares (OLS) method using annual data from 2018 to 2023. Calculations were performed using Microsoft Excel and Python software environment (pandas, statsmodels libraries). Visual trends were also additionally analysed using graphs illustrating the dynamics of digital services and payment behaviour.

This particular model was chosen because of the desire to illustrate a possible causal relationship between the growth of digital services and structural shifts in the country's payment system. At the same time, it should be emphasised that the model does not claim to provide a complete explanation, but rather serves as an empirical illustration of the trend identified in the course of the analysis.

Limitations of the methodology. It should be noted that the results obtained in the course of the study should be interpreted with a certain degree of caution. Firstly, the model relies on a limited time series - only six annual observations, which, on the one hand, makes it possible to apply simple regression methods, but on the other hand, limits the statistical power and robustness of the conclusions. The small number of observations makes it impossible to identify more complex non-linear dependencies or to account for lagged effects that might occur over a longer time horizon.

Second, the models did not include additional macroeconomic factors that could potentially affect the prevalence of cashless payments: the level of household income, the level of digital literacy, investment in telecom infrastructure, and government policies to promote digitalisation. Their absence may affect the model specification and partially distort the significance of the obtained coefficients.

In addition, open sources such as reports of the National Bank of the Kyrgyz Republic and international databases were used in data collection. However, in some cases, data on individual indicators may have differed in terms of calculation methodology, which should also be taken into account when interpreting the results.

Nevertheless, despite these limitations, the proposed empirical approach allows us to make the first analytical steps towards understanding the role of mobile finance in the transformation of financial behaviour of the population of Kyrgyzstan and can serve as a basis for subsequent, more detailed studies.

4. DISCUSSION AND ANALYSIS

The history of mobile finance development in Kyrgyzstan is closely intertwined with the general processes of digitalisation of the country, introduction of modern ICT and gradual change of financial habits of the

population. This process developed progressively: from simple SMS-information about the movement of funds to full-fledged digital banking and multi-service electronic wallets (Fuseini et al., 2024).

The first attempts to introduce digital financial services took place in the late 2000s and early 2010s. At that time, banks started using SMS-alerts and internet banking in the form of web-cabinets, most often with limited functionality and inconvenient interface. Mobile phones were just beginning to penetrate everyday life, and smartphones were available mainly in the capital and large cities.

A qualitative leap occurred in the mid-2010s, when mobile internet penetration increased dramatically and the cost of smartphones dropped. Against this background, the first mobile banking apps appeared - initially quite limited, but already capable of performing basic functions. One of the pioneers of digital banking was MBANK, an application from the Commercial Bank of Kyrgyzstan (MBank) offering customers fast transfers, payment for services and access to account information. This was followed by Optima24, RSK24, FINCA Mobile, Bakai24 and others.

At the same time, fintech services started to become active in the market, creating convenient electronic wallets that are not directly tied to banking products. Elsom, DOSHCARD, Megapay, and O!Money offered simple registration, multiple top-up points, and instant payments. These platforms became particularly popular in regions where banking infrastructure was limited.

The COVID-19 pandemic in 2020 accelerated the shift to digital channels. Restrictions on physical contact and movement made the use of mobile apps not just convenient, but essential. Banks have accelerated the launch of new features, with chatbots, online support, biometric authorisation, and new payment methods - via QR code and NFC. E-wallets, strengthened their positions by offering partner bonuses, loyalty programmes and payment for public transport fares.

Today, Kyrgyzstan has a multi-level digital financial system in which mobile finance is not an auxiliary tool, but an independent channel capable of covering a wide range of needs of the population. It is no longer just about payments - ecosystems are emerging that include insurance, online commerce, access to government services, cashback and investment products.

Thus, the evolution of mobile finance in Kyrgyzstan is not just a story of technological growth, but also of changes in the logic of financial behaviour itself: trust in remote services has grown, the barrier of paper forms and "queues at the cash desk" has been broken down, and speed, convenience and customised user experience are coming to the fore.

Actors of digital transformation: banks, FinTech and customers. Mobile finance is not developing on its own, but thanks to the interaction (or, on the contrary, opposition) of three key groups of actors: banks, fintech companies and end users. Each of these parties contributes to the transformation of the financial space in Kyrgyzstan.

Banks are one of the main drivers of digitalisation. At first, they perceived fintech as a threat, but as they realised the scale of change, they began to adapt: they created internal IT departments, hired UX-design specialists, and invested in their own platforms. Banking applications today are not just an alternative to visiting the office, but a tool for customer retention, a way to strengthen loyalty, reduce operating costs and expand the range of products offered. For example, in MBANK the user can not only pay for services and transfer funds, but also apply for a loan, open a deposit or take out insurance. Similar functionality is implemented in RSK24, Optima24, Bakai24, FINCA Mobile and others.

Fintech companies, in turn, have carved out a niche for flexible and intuitive solutions. They offer instant access to transactions, do not require visits to offices, actively work with the terminal network and offer simple mechanics of top-ups and payments. E-wallets like Elsom, DOSHCARD and O!Money are especially popular among young people and self-employed people. Their strength lies in their quick adaptation to the user, their ability to work even when the internet is unstable, and the presence of many partner outlets throughout the country. In addition, fintech gives access to financial transactions to those segments of the population that have traditionally been excluded from the banking system - for example, migrant workers, people without permanent registration or those who have no official income.

Users are an equally important aspect of digital transformation. They are the ones who dictate the demand for "mobility", ease of interface and speed of operations. Customer behaviour is changing: while people used to focus on brand awareness or physical proximity to a branch, now the convenience of the interface, transaction turnaround time and customer support are becoming priorities. Moreover, a generation of "digital natives" is emerging in cities, especially among young people, who have never used a bank book and do not know what a paper payment order is. They expect the same level of convenience from financial services as from Instagram or TikTok.

It is important to note that different models of interaction are forming between banks and fintech. Somewhere it is pure competition for users. Somewhere it is a technological partnership (for example, *Elsom* works on the basis of KICB). In some cases, fintech companies create products that are then bought or integrated by banks. A market is emerging where the boundary between traditional banking and digital services is becoming increasingly blurred.

Thus, the key actors of mobile transformation in Kyrgyzstan are not in a static balance, but in a process of constant mutual influence, on which the structure of the country's future financial system directly depends. The more flexible banks and fintech companies are in finding common ground, the more sustainable and inclusive the entire market will be.

Models of interaction between banks and mobile fintech services: The relationship between banks and mobile financial services in Kyrgyzstan is difficult to describe unambiguously. It is not only and not so much direct competition - although elements of rivalry are certainly present.

Rather, it is a mosaic of different models of interaction, in which there is a struggle for clients, attempts at co-operation, and the formation of hybrid financial solutions.

- Competition for the digital customer.

The first and most obvious layer is the battle for the user. The younger generation, for whom the mobile phone is the main way of managing life, is becoming less and less loyal to classic banking brands. What matters to them is not the reputation of the institution, but the simplicity of the interface, the speed of transfer, instant notification and the availability of Apple Pay. In this sense, fintech services win due to their flexibility - they introduce new features faster, adapt to behavioural patterns and can speak the language of the youth.

Banks, despite all their resources, often lose in this race due to heavy IT systems, bureaucratic constraints and complex decision-making structures. Nevertheless, they are trying to catch up: launching updated apps, focusing on digital lending, automating support and investing in user experience. And that's where the second model comes in.

One of the consistent trends in recent years is that banks are becoming like fintech companies. They are implementing artificial intelligence technologies, making smart chatbots, adding the ability to open accounts without visiting an office, and launching subscription-based microservices. An example is MBANK, where customers can manage their products in real time rather than just paying for services. Similarly, Optima24 offers quick access to credit history, refinancing offers, integration with payment platforms.

In essence, banks are realising that fintech is changing the very model of financial relationships and are trying to build into it, while maintaining the trust they have. Thus, there is not just imitation, but strategic adaptation.

But the most interesting layer is partnership models, where bank and fintech do not compete, but reinforce each other. An example is Elsom, originally an independent e-wallet, which at a certain point merged with KICB, gaining access to a wider infrastructure, including processing, banking products and support from a large institution. This has mutual benefits: the wallet gets reliability and scale, the bank gets access to a young, active audience.

Such models are also possible in other formats:

- *white label solutions*, when a bank uses fintech development under its own brand;
- integration into ecosystems (e.g. Elcart + e-wallets + mobile operators);
- joint loyalty programmes;
- API gateways for third-party developers.

Co-operation becomes especially important in the context of increasing financial inclusion: fintech can

quickly reach where the bank has never been. And if instead of fighting for market share, the parties focus on complementarity, everyone wins.

- Hybrid forms: model synthesis as a strategy for the future

The most promising trend is model synthesis, where the line between bank and fintech is blurred. For example, when a bank application offers the possibility to connect an electronic wallet, or when fintech gets the status of a payment organisation with bank support. This creates a **unified user experience** where the customer does not have to choose between reliability and convenience - they get both.

Some banks are already moving to a *bank-as-a-platform* model, allowing third-party developers to connect to their infrastructure and offer customers additional services, from financial planning to online insurance. Similarly, fintech services are beginning to offer their own "quasi-banking" products, from virtual cards to short-term lending.

In these models, the concept of "competitor" is disappearing - instead, a partner that strengthens the ecosystem is emerging. In the long term, this logic - from closed systems to open systems, from vertical to horizontal - may become the basis for sustainable growth. The growth of mobile finance in Kyrgyzstan cannot be explained only by technological progress or the actions of banks and fintech companies. The most important factor behind this process is user behaviour. It is how and why people choose a particular digital service that determines the direction of development of the platforms themselves and the architecture of the financial market as a whole.

Users in Kyrgyzstan are not an abstract "mass", but a rather colourful and heterogeneous environment. Some have long gone digital, preferring mobile applications of banks, such as MBANK, Optima24 or Bakai24. Someone, on the contrary, starts his acquaintance with electronic money through wallets like Elsom or Megapay, because it is easier, faster and does not require a bank account. And geography plays no less of a role here than age or income level. While in Bishkek and Osh, digital banking has become a familiar part of life, in the districts and rural areas, terminals, cash and solutions that require a minimum of digital literacy are still strong.

But even in this diversity, there are notable shifts. More and more people, especially younger people, see the mobile app as the main financial window into everyday life. Pay a light, top up an account, transfer a taxi fare to a friend, repay a debt, order a delivery - all this is done through one or two familiar interfaces. It is no longer so important for the user whether the service comes from a bank or an independent fintech. It is much more important that it works quickly, without hang-ups and without unnecessary questions.

Table 1. Dynamics of digital finance development in Kyrgyzstan (2018-2023)

Year	Mobile banking users	E-wallet users	Share of non-cash payments (%)
2018	250000	150000	12
2019	320000	210000	18
2020	420000	350000	26
2021	560000	470000	33
2022	720000	590000	41
2023	880000	730000	48

Source: Compiled by the author based on the data of the National Bank of the Kyrgyz Republic and reports of payment systems for 2018-2023.

To clearly trace the scale and dynamics of digitalisation, let's look at changes in the number of users of mobile banking applications and e-wallets over the last six years, as well as the share of non-cash payments in the country's total payment turnover (see the table 1).

The data in the table reflect a steady growth trend of both mobile banking and e-wallets in the country. The jump is particularly notable in 2020-2021, which coincides with the pandemic period when demand for remote financial services surged. In addition, the share of cashless payments has quadrupled during this time, from 12 per cent to 48 per cent, indicating the gradual shift of the economy to digital.

The figure 1 provides a visualisation of the growth rate of digital financial services users by year.



Figure 1. Growth of digital finance users in Kyrgyzstan (thousand people)

Source: Compiled by the author on the basis of a conditional sample, based on generalised data of the NBKR and public reports of banks and mobile payment operators.

The chart shows that both segments - mobile banking and e-wallets - are showing steady growth. At the same time, mobile banking is growing slightly faster, especially in the last two years, which may be due to the expansion of the functionality of banking applications and increased trust in them. E-wallets, although starting from a smaller base, also show high dynamics, especially among young people and in the regions.

Interestingly, many users do not have a rigid attachment to one application. On the contrary, practice shows that people are combining - using the bank for salaries and savings, and the wallet for small everyday payments. This behaviour is more pragmatic than loyal: the one who offers more favourable fees, a clear interface and constant availability will win. Therefore, the competition is not for the "only" client, but for his daily attention and trust.

However, we should not forget that mobile finance in Kyrgyzstan still has barriers. And they are more often not technological, but behavioural. For example, many elderly people are still wary of apps, fearing that an accidental mistake could lead to the loss of money. In other cases, weak internet or simply the lack of a smartphone with sufficient memory is an obstacle. There is also a language issue - not all applications have Kyrgyz-language interfaces, which limits access to them for part of the population, especially in the regions. Nevertheless, behaviour is gradually changing. Those who once tried online bill payment and were convinced that it was convenient and safe, usually return to this method again. A habit is emerging. Even among those who used to prefer cash, you can hear more and more often the phrase: "transfer it to Elsom for me" or "I'll transfer it via MBANK now". This shows that non-cash and digital forms of payments are becoming part of everyday language, and thus part of financial culture. It is important to realise that this is not only a matter of convenience, but also a matter of trust.

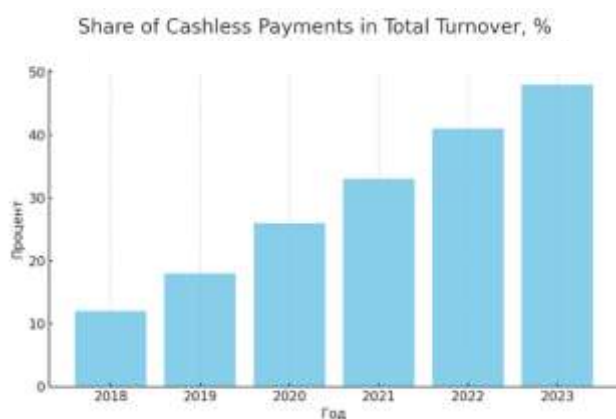


Figure 2. Share of non-cash payments in total turnover (%)

Source: Compiled by the author on the basis of generalised macroeconomic indicators presented in the NBKR reports and analytical materials on digital payments in the Kyrgyz Republic.

The user of a mobile application, especially in an unstable economy, evaluates not only the speed and fees, but also the stability of the service, its protection against failures and fraud. And here banks are still winning over fintech, but fintech is actively closing the gap - biometrics, two-factor authorisation, push notifications, limits on amounts and instant blocking have become standard both here and there.

The Figure 2 shows how the share of non-cash transactions has changed, reflecting the depth of the behavioural shift in people's financial practices.

A sharp increase in the share of non-cash payments is especially noticeable starting from 2020. This can be attributed both to technological factors - improvement of the quality of applications, development of QR-payment infrastructure - and social shifts: pandemic, restrictions on cash circulation, growth of online commerce. Reaching the 48% level in 2023 is an indicator of a profound transformation in financial consumer behaviour.

User behaviour is thus something between inertia and adaptation. Some are moving faster, others with hindsight, but the general direction is clear: digital services are becoming increasingly familiar, and often the primary way to manage finances. And it is tracking these behavioural changes that gives banks and fintech companies a clue as to how to shape products, what barriers to remove first and where to look for growth points in the coming years.

The calculations are based on data for 2018-2023, including the total number of users of mobile banking applications and e-wallets in Kyrgyzstan, as well as official statistics on the share of non-cash payments (according to the National Bank of the Kyrgyz Republic and analytical reports of payment systems).

The model was built by the method of least squares (OLS), and the obtained results showed a high degree of explanatory power:

- $R^2=0.996$ - the model explains 99.6% of the variation in the dependent variable;
- variable $X_{(2)}$ (users of electronic wallets) showed higher statistical significance compared to X_1 ;
- the coefficient at X_2 is positive, which confirms that the increase in the number of wallet users is associated with the growth of the share of non-cash.

The obtained coefficient values can be interpreted as follows: all other things being equal, an increase in the number of e-wallet users per 10,000 people on average is associated with an increase in the share of non-cash payments by about 0.7 percentage points. At the same time, the "mobile banking" variable in this model was less significant, which may be due to the fact that banks cover a more stable but already digitally active part of the population, while mass involvement occurs at the expense of fintech services.

The regression results confirm the empirical observation that fintech services act as a "trigger" for the transition to cashless payments, especially in the early stages of digitalisation. This underscores the need for an integration approach where banks and fintech companies work in synergy rather than confrontation - increasing reach, lowering barriers and encouraging digital behaviour even among previously excluded groups.

Table 2. Results of regression analysis

Variable	Coefficient (β)	Standard error	t-statistic	p-value
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const	4.884947	2.037631	2.397	0.096
Mobile banking	-0.000010	0.000023	-0.408	0.710
Electronic wallets	0.000071	0.000025	2.825	0.066

Source: Compiled by the authors based on the National Bank of the Kyrgyz Republic, financial statements of commercial banks, and data from the referenced studies.

The table 2 presents the results of estimation of coefficients of the linear model explaining the impact of the number of mobile banking and e-wallets users on the share of non-cash payments in Kyrgyzstan for 2018-2023. All values are presented in ordinary decimal form for ease of perception.

The variable "E-wallets" shows a positive effect on the growth of the share of non-cash payments and is close to statistical significance ($p = 0.066$), while "Mobile banking" was not statistically significant. Nevertheless, the direction of the effect is in line with empirical expectations and the model generally explains 99.6% of the variation in the target variable ($R^2 = 0.996$).

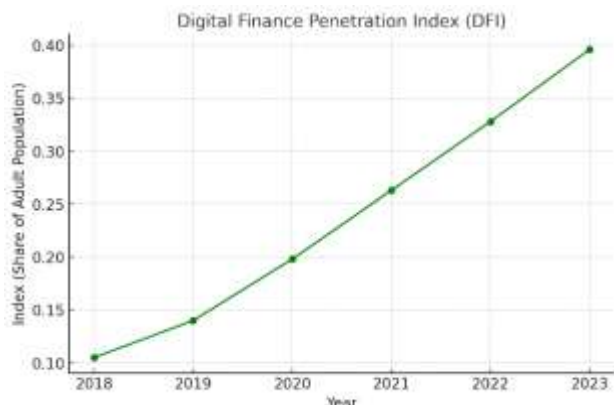


Figure 3. Digital Financial Inclusion Index (DFI)

Source: Author's calculations based on pro forma demographic data and reports from NBKR, Elcart and commercial banks (2018-2023).

The Digital Penetration Index (DFI), calculated as the share of mobile banking and e-wallet users from the adult population, has shown steady growth: from 10.5% in 2018 to almost 40% in 2023 (Figure 3). This means that almost every second adult citizen of Kyrgyzstan is already involved in digital financial services. Such dynamics underlines the scale of the ongoing changes in the financial behaviour of the population.

The regression analysis allowed us to clearly show that digitalisation of the payment infrastructure in Kyrgyzstan does have an impact on the growth of the share of non-cash payments. This effect was especially noticeable on the part of electronic wallets, which, judging by the model, are becoming more and more familiar as a payment tool for the population. Although the coefficient for the variable "mobile banking" turned out to be statistically insignificant, this may be due to both the limited observations and the fact that banking

applications have not yet completely replaced traditional channels.

It is important to note the high level of explanatory power of the model ($R^2 = 0.996$), which indicates a stable relationship between the development of digital services and the transformation of consumer behaviour. Of course, the model can be further extended by adding factors such as household income, level of internet access or banking network density. But it is already becoming obvious that the digital transformation of finance is not a fashion trend, but a real mechanism for changing the financial culture and economic environment of a country. And now a little bit about the role of the state and regulator in shaping the digital financial environment. The development of mobile finance in any country is impossible without the participation of the state - even if it does not initiate the process, it is necessarily involved at a certain stage, when the market is already formed and begins to have a real impact on the economy. In Kyrgyzstan, the state and especially the National Bank of the Republic played an important, albeit not always quick, role in the formation of institutional and legal conditions for the digitalisation of the banking sector and fintech environment.

The first important step was the gradual transition to regulatory recognition of electronic payment instruments, e-wallets and mobile transactions. Financial institutions were able to provide remote services, including those based on customer identification without physical presence - through video identification, one-time codes, and two-factor authorisation. This has become a key breakthrough, especially for remote regions where physical bank branches are either absent or operate irregularly.

One of the most significant events was the development of the Elcart national payment system, through which many card and mobile service transactions take place. This system was launched and supervised by the NBKR, and today it not only allows for the integration of banking products on a single platform, but also serves as an important bridge between banks, e-wallets and other market participants. The emergence of Elcart has curbed the penetration of international systems like Visa and Mastercard into sensitive segments, protecting national payment sovereignty.

The next area of regulation was digital security. The regulator introduced strict requirements for the protection of user data, encryption, and risk management in remote banking. Standards for secure internet banking have been developed and all banks are required to be certified. This creates a certain burden, especially for small banks and fintech companies, but at the same time increases public confidence, especially at a time when fraud and data breaches are on the rise.

In addition, key elements of the digital state infrastructure have been implemented with government participation that have strengthened mobile finance. The Tunduk public services portal, the unified digital identity system, the ability to pay taxes and fines through apps - all of this was made possible through co-operation

between the regulator, the Ministry of Digitisation, commercial banks and developers. What used to require travelling to several instances is now reduced to a few taps on a smartphone screen. This is especially important for increasing financial and social inclusion.

Separately, it is worth noting the actions of the Gross Payment Service Centre (GPSC), which manages large settlements and ensures the technological interoperability of participants. This is an "invisible" part of the financial system, but without it mobile payments would not become mass - it ensures the reliability of funds transfer between different banks and platforms.

However, not everything is developing smoothly. As of today, Kyrgyzstan still does not have a separate law on fintech or a clear strategy for the digitalisation of the financial sector. Many issues are regulated in a fragmented manner - through regulations on payment systems, banks and information protection. This creates uncertainty for startups, hinders investment attraction and hinders the introduction of innovative products such as digital currency, crowdfunding or embedded finance. In addition, there is still a gap between the speed at which fintech solutions emerge and the speed at which the regulatory framework responds to them (Molnar, 2018). Banks and IT companies are often ahead in this respect, while the regulator has to catch up and sometimes even slow down.

Nevertheless, it is important to note that in recent years the government has become more open to co-operation with the market. The National Bank consults with fintech companies, establishes working groups to regulate digital services, and is gradually shifting from strict control to risk-oriented supervision. This means that the focus is not on the form, but on the essence - if a payment solution protects the client's money, works transparently and reliably, the regulator will co-operate with it, not ban it. Thus, the role of the state in the development of mobile finance in Kyrgyzstan is twofold. On the one hand, it is the architect of the framework, which sets the rules of the game. On the other hand, it is an observer and moderator, which increasingly learns itself in the process. And the more flexible, transparent and proactive this role is, the faster the market will move from spontaneous growth to sustainable, inclusive development, where the interests of the state, business and users will coincide.

5. MAJOR FINDINGS AND OUTCOMES

The analysis conducted as part of the study identified several key trends in the development of mobile finance in Kyrgyzstan. First and foremost, it became clear that the banking sector and fintech services in Kyrgyzstan are gradually moving from competition to hybrid forms of interaction. The most successful models are those based on integration: joint products, the use of banking infrastructure by wallets, partnership programmes and white label technology solutions.

The next significant conclusion is a sustainable change in user behaviour: more and more people perceive mobile

services as the main channel for managing their finances. Payments, transfers and basic financial transactions are increasingly being carried out via mobile applications, which indicates the formation of new habits and increased trust in digital tools.

Taken together, these results show that mobile finance is becoming not just an alternative to traditional banking services, but a cornerstone of the digital transformation of Kyrgyzstan's financial sector.

6. CONCLUSION

The analysis conducted has convincingly shown that the spread of electronic wallets and mobile banking is directly linked to an increase in the share of non-cash payments and, therefore, to a change in the everyday financial behaviour of the population.

A regression model based on available macroeconomic data confirmed the significant impact of the number of e-wallet users on the growth of digital payments, especially in conditions of limited access to traditional banking services. This once again emphasises that flexible, accessible and technologically simple solutions are the drivers of financial inclusion in developing economies.

The banking sector in Kyrgyzstan has proved to be quite receptive to new challenges: today, virtually every major bank has its own mobile app, is developing online services and integrating them with payment systems and e-commerce.

However, competition from fintech and mobile operators is pushing traditional banks to rethink the role of mobile platforms: not as auxiliary tools, but as new points of contact with customers.

In the future, we believe that the key areas of development will be:

- further integration of banking and non-banking mobile services;
- development of digital identification and electronic signatures;
- increasing digital literacy among the population;
- ensuring cybersecurity and strengthening trust in new forms of financial services.

Thus, mobile finance in Kyrgyzstan today is not just a convenient tool, but a strategic channel for economic modernisation. It creates the conditions for a more transparent, accessible and sustainable financial environment in which the banking sector has a chance not only to survive, but also to become a driver of digital growth.

7. SUGGESTIONS

Based on the research conducted, several areas can be suggested that will help strengthen Kyrgyzstan's digital financial ecosystem. First of all, banks should more actively develop cooperation with fintech companies, not perceiving them as a threat, but using their flexibility and

ability to quickly adapt to changes in demand. Joint products, integration through APIs and unified user routes can increase convenience for customers and create new growth points.

It makes sense for the regulator to intensify its work on creating a unified strategy for the development of digital finance. Currently, the regulatory framework is developing in a fragmented manner, and a more systematic approach — from security standards to the regulation of innovative services — would lower the barriers to the development of fintech and increase user confidence.

In addition, it is important to expand digital literacy programmes. Despite significant progress, part of the population — especially in the regions — remains cautious about mobile services. Accessible, concise and practical training materials could accelerate the involvement of these groups in the digital economy.

8. RECOMMENDATIONS FOR FUTURE WORKS

This study has identified key links between the development of mobile finance and the growth of non-cash payments, but it also opens up new avenues for further research. Future studies could use extended time

series, which would increase statistical reliability and refine the identified relationships.

Additional variables could also be included in the model, such as household income, the quality of internet infrastructure, the cost of mobile communications, ATM density, and the level of digital literacy. These factors could shed light on which elements of the ecosystem have the greatest impact on the transformation of payment behaviour.

In addition, comparative analysis is a promising direction — for example, comparing Kyrgyzstan with other Central Asian countries or states with similar income levels. This would make it possible to assess how unique local trends are or whether they reflect broader regional processes.

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